What is claimed is:

1. A device comprising:

a composite material comprising aligned nanowires at least partially coated by a magnetic material, wherein the nanowires are electrically connected by at least one of contact among the nanowires and a conductive material present in the composite material, wherein at least a portion of the nanotubes protrude from a surface of the composite material by an average protrusion of at least twice the average diameter of the nanowires, and wherein the nanowires have an average length of about 0.1 μm to about 10,000 μm.

2. The device of claim 1, wherein the device is an electron field emission device.

3. The device of claim 1, wherein the protruding nanotubes comprise broken ends.

4. The device of claim 1, wherein the magnetic material comprises less than about 0.95 vol.% of the coated nanowires.

5. The device of claim 4, wherein the magnetic material comprises less than about 0.75 vol.% of the coated nanowires.

6. The device of claim 1, wherein the average protrusion height is at least 20 nm.

7. The device of claim 6, wherein average protrusion height is at least 100 nm.

8. The device of claim 1, wherein the composite material comprises at least 1 vol.% nanowires to a depth of at least 2 μm from the surface from which the nanowires protrude.

9. The device of claim 1, wherein the variation in average protrusion height is less than 40%.

10. The device of claim 1, wherein the composite material comprises the conductive material.

11. The device of claim 1, wherein the composite material is disposed on a substrate as an arrayed emitter structure.

12. The device of claim 1, wherein the composite material is part of an emitter structure, and wherein the device further comprises an apertured grid located over at least a portion of the composite material, the grid comprising a grid layer and an insulating layer.

13. The device of claim 1, wherein the composite material is part of an emitter structure, and wherein the device further comprises an apertured grid located over at least a portion of the emitters, the grid comprising at least a first and a second grid conductor layer, the first grid conductor layer separated from the emitter structure by a first insulating layer, and the first and second grid conductor layers separated by a second insulating layer.

14. The device of claim 13, wherein the apertured grid further comprises third and fourth grid conductor layers, the third grid conductor layer separated from the second grid conductor layer by a third insulating layer, and the fourth grid conductor layer separated from the third grid conductor layer by a fourth insulating layer.

15. The device of claim 1, wherein the nanowires are selected from carbon, silicon, and germanium.

16. The device of claim 15, wherein the nanowires are carbon nanotubes and at least a portion of the magnetic material is present in the interior of the nanotubes.

17. The device of claim 1, wherein the coating comprises a structure selected from the group consisting of ferromagnetic, ferrimagnetic, near-superparamagnetic, and superparamagnetic.

18. The device of claim 17, wherein the structure is selected from the group comprising near-superparamagnetic and superparamagnetic.

19. A process for fabricating a device comprising a field emission structure, comprising the steps of:

providing nanowires at least partially coated by a magnetic material, the nanowires having an average length of about 0.1 μm to about 10,000 μm;

mixing the nanowires with a liquid medium;

applying a magnetic field to the nanowires, such that the nanowires become aligned;

securing the aligned nanowires in a matrix; and

exposing a portion of the aligned nanowires to provide protrusion from a surface of the matrix by an average protrusion of at least twice the average diameter of the nanowires.

20. The process of claim 19, wherein the magnetic field is a gradient magnetic field.

21. The process of claim 19, wherein the liquid medium comprises a precursor capable of being treated to form the matrix.

22. The process of claim 19, wherein the liquid medium comprises at least one of a binder and an adhesive.

23. The process of claim 19 wherein the matrix comprises a conductive material.

24. The process of claim 19, wherein application of the magnetic field induces alignment such that one end of the aligned nanowires substantially contacts a substrate.

25. The process of claim 19, wherein the exposing step comprises removing a surface portion of the matrix material.

26. The process of claim 19, wherein the exposing step comprises separating the matrix comprising the nanowires from at least one of a removable layer and a particle layer.

27. The process of claim 26, wherein the removable layer comprises a gel-like layer.

28. The process of claim 19, wherein the exposing step comprises sectioning the matrix comprising the nanowires and removing a surface portion of the matrix material from the resulting body.

29. The process of claim 19, wherein the liquid medium comprises a surfactant.

30. The process of claim 19, further comprising the step of shear mixing the mixture comprising the nanowires and the liquid medium.

31. A process for fabricating a device comprising an arrayed field emission structure, comprising the steps of:

providing a substrate comprising an arrayed pattern of conductive metal pads;

depositing onto the metal pads a mixture comprising liquid, a conductive material, and nanowires at least partially coated by a magnetic material; and

applying a magnetic field to the nanowires, such that the nanowires become aligned; and

removing the liquid components of the mixture and consolidating the conductive material to form a matrix around the nanowires, such that a portion of the nanowires protrude from the surface of the matrix.

32. The process of claim 31, wherein the average protrusion of the nanowires from the surface of the matrix is 0.1 to 10 μm.

33. The process of claim 31, where the average length of the nanowires is 0.1 to 100 μm.

34. The process of claim 31, wherein the mixture further comprises a surfactant.

35. The process of claim 31, further comprising the step of shear mixing the mixture prior to deposition.

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